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GIFFORD, KRASS, SPRINKLE,ANDERSON & CITKOWSKI, P.C
PO BOX 7021
TROY, MI 48007-7021

EXAMINER	
WARTALOWICZ, PAUL A	
ART UNIT	PAPER NUMBER
1735	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/784,055	BUXBAUM, ROBERT E.	
	Examiner	Art Unit	
	PAUL A. WARTALOWICZ	1735	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-22,24,25 and 27-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-22,24,25 and 27-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/08/10 has been entered.

Response to Arguments

Applicant's arguments with respect to claims 16-22, 24, 25, and 27-30 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 16-22, 24, 25, and 27-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation in claim 16, line 5 of "providing combustion gas to burn stoichemetrically with said feedstock" renders the claims indefinite. It is unclear from the recitation whether the feedstock is burned or subjected to an endothermic reaction as at lines 5-6 the claim recites that the feed stock in the reactor undergoes an endothermic reaction which would not be a stoichiometric combustion. For the

purposes of examination, the claim will be interpreted as two separate feeds composed of the same feedstock, the first part being endothermically reacted and the second part of the feedstock being burned.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 16, 21, 22, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Towler et al. (U.S. 6409974) in view of Fuderer (US 444020) and Autenrieth (US 6423435), and Goebel (US 2003/0093949).

Towler teach a process for forming hydrogen from a feedstock (col. 1) wherein a feedstock is heated with a fuel exhaust stream (col. 10, lines 25-35) and then is fed to a reformer and an endothermic product and hydrogen are produced (col. 6, lines 25-35).

Regarding claims 16, and 24; Towler fails to teach providing a combustion gas to burn stoichiometrically with said feedstock.

Towler does teach that a fuel stream (natural gas) is combusted to heat the reactor (col. 9, lines 50-65) and that the feedstock comprises natural gas (col. 5, lines 30-46).

Fuderer, however, teaches a method of reforming (col. 3, lines 10-20) that a portion of the feedstock comprising natural gas (col. 3, lines 30-40) is used in the combustion reaction for the purpose of providing heat to the steam reforming reaction (col. 6, lines 25-40).

As Towler does teach that a fuel stream (natural gas) is combusted (col. 9, lines 50-65) and that the feedstock comprises natural gas (col. 5, lines 30-46) and Fuderer teaches a method of reforming (col. 3, lines 10-20) that a portion of the feedstock comprising natural gas (col. 3, lines 30-40) is used in the combustion reaction for the purpose of providing heat to the steam reforming reaction (col. 6, lines 25-40), it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to use part of the feedstock of in the combustion reaction of Towler because it is known to use part of a natural gas feedstock in a combustion reaction in order to heat the steam reforming reaction.

Towler and Fuderer teach a method as described above, but fail to teach providing the combustion gas to burn stoichiometrically with the feedstock.

Towler does teach that the fuel is burned with air in the combustion reaction (air is supplied to the raffinate of the membrane reactor which is combined with fuel, col. 20, lines 1-15).

Goebel teaches a method of reforming (para. 0013) wherein fuel is combusted with a stoichiometric amount of oxygen for the purpose of maximizing heat input by the combustion reaction (para. 0038).

As Towler teaches that the fuel is burned with air in the combustion reaction (air is supplied to the raffinate of the membrane reactor which is combined with fuel, col. 20, lines 1-15) and Goebel teaches a method of reforming (para. 0013) wherein fuel is burned with a stoichiometric amount of oxygen for the purpose of maximizing heat input by combustion (para. 0038), it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the fuel of Towler and Fuderer burned in the combustion reaction with a stoichiometric amount of oxygen in order to maximize heat input to the steam reformer.

Towler fails to teach that hydrogen is passed through a membrane to thereby separate the hydrogen from the raffinate stream after the water gas shift reaction.

Towler teaches that the hydrogen reformate is then fed to a shift reaction zone (col. 7, lines 55-65) for further production of hydrogen (col. 7, lines 55-65). Towler also teaches that hydrogen purification is important in the invention (col. 1, lines 1-15)

Autenrieth, however, teaches a method of making hydrogen in a fuel cell system arrangement (col. 1) wherein an effluent from a reformer is sent to a membrane reactor comprising a water gas shift reaction for the purpose of generating additional hydrogen

(col. 4, lines 400-51) and a residual conversion gas which is not separated (raffinate) (col. 3, lines 45-55).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicants invention was made to provide a membrane reactor comprising a water gas shift reactor in Towler as in order promote a water gas shift reaction and purification of hydrogen product as taught by Autenrieth and because Towler stresses the importance of hydrogen purification (col. 1, lines 5-15).

Regarding claim 21, Autenrieth teaches that the residual conversion gas not separated is burnd to produce a waste gas stream (col. 3, lines 45-60).

Regarding claim 22, Towler teaches that the exhaust of the combustion gases is in a heat exchange relationship with the feedstock so as to preheat the feedstock prior to the feedstock entering the reactor (col. 10, lines 25-45; col. 11, lines 1-15, 30-40).

Regarding 25, it would have been obvious to one of ordinary skill in the art to provide combustion supporting gas provided stoichiometrically to burn the raffinate in order to maximize heat input by the combustion reaction (para. 0038) as taught by Goebel, as described above.

Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Towler et al. (U.S. 6409974) in view of Fuderer (US 444020) and Autenrieth (US 6423435), and Goebel (US 2003/0093949) and in further view of Leftin (US 4539310).

Towler, Fuderer, Autenrieth, Goebel teach a method as described above in claim 16, but fail to teach that the feedstock is preheated in a pump supplied boiler.

Leftin teaches a steam reforming method (col. 1, lines 5-15) comprising pumping hydrocarbon to a heat exchange process prior to reforming (col. 8, lines 1-15).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide pumping the hydrocarbon feed of Towler, Fuderer, Autenrieth, and Goebel to a heat exchange process prior to reforming (col. 8, lines 1-15) because such a configuration is known in the art as taught by Leftin.

Regarding the limitation of the heat exchanger being a boiler, Towler teaches that the fuel/water mixture is preheated in a heat exchange step (col. 10, lines 25-40). As some of the water in the feed will be boiled, it appears that the feedstock is heated within a boiler.

Regarding claim 18, Towler, Fuderer, and Autenrieth, Goebel teach a method such that feedstock is sent to burner as applied to claim 16. Towler further teaches that the combustion process heats the steam reformer (col. 6, lines 25-40).

Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Towler et al. (U.S. 6409974) in view of Fuderer (US 444020) and Autenrieth (US 6423435), and Goebel (US 2003/0093949) and Leftin (US 4539310) in further view of Loos (US 4128622).

Towler, Fuderer, Autenrieth, Goebel, Leftin teach a method as described above in claim 16, but fail to teach monitoring the reactor temperature and communicating reactor temperature to a computer controller (claim 19) and monitoring reactor pressure and communicating reactor pressure to said computer controller (claim 20).

Regarding claim 19, Towler teaches that temperatures within the reactor are monitored (col. 6, lines 20-30). Loos, however, teaches a chemical process (col. 1, lines 3-10) wherein temperatures are monitored and sent to a computer controller for the purpose of maintaining a temperature (col. 3, lines 50-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the temperature of the reactor monitored in Towler, Fuderer, Autenrieth, Goebel, Leftin sent to a computer controller for the purpose of maintaining the temperature (col. 3, lines 50-60) as taught by Loos and because Towler teaches that the reactor temperature is monitored.

Regarding claim 20, while Towler does not teach monitoring pressure, Towler does teach that the pressure of the reactor is maintained within 100-350 kPa (col. 6, lines 25-30). Loos, however, teaches a chemical process (col. 1, lines 3-10) wherein pressures are monitored and sent to a computer controller for the purpose of maintaining a certain pressure (col. 3, lines 50-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the pressure of the reactor monitored in Towler, Fuderer, Autenrieth, Goebel, Leftin sent to a computer controller for the purpose of maintaining the temperature (col. 3, lines 50-60) as taught by Loos and because Towler teaches that the reactor pressure should be maintained within a certain temperature range.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Towler et al. (U.S. 6409974) in view of Fuderer (US 444020) and Autenrieth (US 6423435), and Goebel (US 2003/0093949) and in further view of LaPierre (US 6348278).

Towler, Fuderer, Autenrieth, and Goebel teach a method as described above in claim 16, but fail to teach that the secondary stage membrane reactor operates at a lower temperature than said reactor.

Towler, however, teaches that the water gas shift reactor is operated at a temperature of 400-450 C (col. 7, lines 55-65).

Additionally, the membrane water gas shift reactor of Autenrieth includes a hydrogen permeable membrane (col. 2, lines 50-60).

LaPierre teaches that hydrogen permeable membranes should be operated at temperatures of 300-450 C (col. 14, lines 1-10).

Therefore, it would have been obvious to one of ordinary skill in the art to operate the membrane water gas shift reactor of Towler, Fuderer, Autenrieth, and Goebel at a temperature of 400-450 C in order to operate membrane gas shift reactor at a temperature compatible with both the shift reaction as taught by Towler and the membrane component of the membrane water gas shift reactor as taught by LaPierre.

Additionally, Towler teaches that the reactor is operated at a temperature of 650-950 C (col. 6, lines 20-30). As the reactor is operated at a temperature of 650-950 C (col. 6, lines 20-30) and the membrane water gas shift reactor is operated at 400-450 C, the membrane water gas shift reactor is operated at a lower temperature than the reactor.

Claims 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Towler et al. (U.S. 6409974) in view of Fuderer (US 444020) and Autenrieth (US 6423435), and Goebel (US 2003/0093949) and in further view of Sanger (US 6190623) and Thompson (US 5281253).

Towler teaches a process as described above in claim 1.

Towler fails to teach modifying the speed of the feedstock entering the reactor in response to sensing a pressure on a purified hydrogen side of secondary stage membrane reactor.

Thompson teaches a method for controlling systems of membranes (col. 1) wherein an inlet to a membrane system is adjusted based upon the pressure of the outlet (permeate side) of a membrane system for the purpose of raising or lowering the product pressure as needed (col. 3).

Sanger teaches a reforming method (col. 1) comprising adjusting the feedstock flow to the stearm reformer, first entering pre-processing, for the purpose of meeting the downstream demands for electrical power (col. 11, lines 15-25).

As Thompson teaches an inlet to a membrane system is adjusted based upon the pressure of the outlet (permeate side) of a membrane system for the purpose of raising or lowering the product pressure as needed (col. 3) and Sanger teaches adjusting the feedstock flow to the stearm reformer, first entering pre-processing, for the purpose of meeting the downstream demands for electrical power (col. 11, lines 15-25), it would have been obvious to one of ordinary skill in the art at the time applicant's

invention was made to control the speed (flow) of the feedstock entering the reactor of Towler in response to the pressure of the hydrogen on the permeate side of the membrane in order to raise or lower the product stream pressure as needed (col. 3) and to meet downstream demands for electrical power.

Regarding claim 30, Towler teaches an endothermic reactor (col. 6, lines 25-35).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL A. WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica L. Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Paul A Wartalowicz/
Examiner, Art Unit 1735